ATTORNEY DOCKET NO. TI 35564 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant:	Kaiping Liu
Serial No.:	10/664,271
Filed:	September 17, 2003
Title:	A SEMICONDUCTOR DEVICE HAVING AN IMPLANTED PRECIPITATE REGION AND A M ETHOD OF MANUFACTURE THEREFOR
Grp./A.U.:	2815
Examiner:	Edward Joseph Wojciechowicz

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(Signature of the person signing the certificate)

ATTENTION: Board of Patent Appeals and Interferences

Sirs:

APPEAL BRIEF UNDER 37 C.F.R. §41.37

This is an appeal from a Final Rejection dated June 8, 2006, of Claims 10-13 and 15-22. The Appellant submits this Brief with the statutory fee of $500.00 as set forth in 37 C.F.R.§41.20(b)(2), and hereby authorize the Commissioner to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 20-0668.

This Brief contains these items under the following headings, and in the order set forth below in accordance with 37 C.F.R. §41.37(c)(1):

I. REAL PARTY IN INTEREST

II. RELATED APPEALS AND INTERFERENCES

III. STATUS OF CLAIMS

IV. STATUS OF AMENDMENTS

V. SUMMARY OF CLAIMED SUBJECT MATTER

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

VII. APPELLANT'S ARGUMENTS

VIII. APPENDIX A - CLAIMS

IX. APPENDIX B - EVIDENCE

X. RELATED PROCEEDINGS APPENDIX

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Assignee, Texas Instruments, Inc.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-9, 14 and 23-28 were previously canceled without prejudice or disclaimer. Accordingly, only Claims 10-13 and 15-22 are pending in this application. Moreover, Claims 10-13 and 15-22 have been rejected under 35 U.S.C. § 103(a). Each of the pending claims is being appealed.

IV. STATUS OF THE AMENDMENTS

The present Application was filed on September 17, 2003. The Appellant filed a first Amendment on January 9, 2006 in response to a first Examiner's Action mailed September 12, 2005. The Examiner entered the first Amendment and subsequently issued a Final Rejection on March 23, 2006. The Appellant then filed a second Amendment on May 22, 2006. The Examiner issued an Advisory Action on June 8, 2006, and in doing so indicated that the second Amendment was entered. The Appellant then filed a Notice of Appeal on June 27, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed, in general, to a semiconductor device having an implanted precipitate region, and a method of manufacture therefore. In one embodiment, particularly that of independent Claim 10, the present invention teaches implanting a precipitate region within a lattice structure of a substrate. (*See,* paragraph [0029] and related FIG. 3). The present invention further teaches introducing a dynamic defect within the lattice structure and proximate the implanted precipitate region, such that the implanted precipitate region affects a position of the dynamic defect within the lattice structure. (*See*, paragraphs [0034] thru [0036], and related FIG. 5). The present invention additionally teaches forming a gate structure over the substrate having the precipitate region therein, the precipitate region being noncontinuous. (*See,* paragraph [0023], and paragraph [0039] and related FIG. 7).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The first and only issue presented for consideration in this appeal is whether Claims 10-13 and 15-22, as rejected by the Examiner, are patentably nonobvious in accordance with 35 U.S.C. §103(a) over U.S. Patent No. 6,593,173 to Anc, *et al.* ("Anc") in view of U.S. Patent No. 6,395,621 to Mizushima, *et al.* ("Miz").

VII. APPELLANT'S ARGUMENT

The inventions set forth in independent Claim 10 and its respective dependent claims are not obvious over the references on which the Examiner relies.

Rejection of Claims 10-13 and 15-22 under 35 U.S.C. 103(a) over Anc in view of Miz

The Examiner has rejected Claims 10-22 under 35 U.S.C. §103(a) as being unpatentable over Anc in view of Miz. In rejecting these claims, the Examiner asserts that:

> the term "noncontinuous" [as used in independent Claim 10] is a relative term that can only be defined by other objective parameters. Since Anc et al implant the same precipitate atoms as claimed, using approximately the same dosages, energies, and with similar anneal temperatures, the resulting precipitate region of Anc would be just as "noncontinuous" as applicant's region. The fact that Anc and applicant refer to what is essentially the same structure as being more or less "continuous" merely illustrates the subjectivity of these terms.

(*See*, page 2 of the Examiner's Advisory Action dated June 8, 2006). The Examiner's obviousness rejection fails for a number of reasons, each of which alone is sufficient to require the Board of Patent Appeals and Interferences to reverse the Examiner's Final Rejection of all of the Appellant's pending claims.

First, the Examiner's obviousness rejection fails because the Examiner has presented, for the very first time on appeal (e.g., in the Advisory Action dated June 8, 2006), a reason for rejection that was not previously presented. Specifically, the Examiner presented an argument in the Advisory Action that the similarities between the dosages, energies and anneal temperatures used to form the precipitate region in the present invention and Anc would inherently form the same precipitate region, regardless of whether the claims of the present invention require that layer to be "noncontiguous" and Anc requires its layer to be "continuous". It should initially be noted that this argument was not presented, in any form, in any of the previous Examiner's Actions, even though this claimed element has been, since the filing of the case, presented in at least one of a dependant or independent Claim. Accordingly, the Examiner has had at least two previous opportunities to make such an argument, and failed, or chose, not to do so. Nevertheless, at this late stage of the prosecution (e.g., at a point when the Applicant has no other opportunity to traverse the Examiner's tardy argument than to file a Notice of Appeal and corresponding Appeal Brief) has the Examiner first raised this new reason of rejection. The Examiner should not be allowed to raise such a new reason for rejection, as the Applicant has not had the opportunity to respond thereto in the normal course of prosecution.

Second, notwithstanding the Examiner's failure to present this reason of refusal earlier, Anc fails to teach or suggest the claimed element of forming a gate structure over the substrate having the precipitate region therein, the precipitate region being noncontinuous. Anc is directed to a low defect density, thin-layer, SOI substrate. (Title). Anc discloses that a substrate **10** may be subjected to an oxygen ion beam or beams **12** of sufficient energy such that the ions are embedded in the substrate **10** to form a precursor layer **14** having precipitates **18** of SiO_x embedded therein. (Column 3, lines 60-67). Anc further requires that the substrate **10** is then subjected to a high temperature annealing protocol in an inert atmosphere, the annealing step redistributing "the implanted oxygen ions and chemically bonding them to silicon to form a continuous buried layer **22** of silicon dioxide (SiO_2)." (*See*, Anc at column 4, lines 45-55). Anc further teaches that such a redistributing can be performed at a temperature in a range between approximately 1300°C to a temperature slightly below the melting temperature of the substrate. (*See*, Anc at column 4, lines 45-55). Anc suggests that a gate structure might thereafter be formed over the continuous buried layer **22**.

Because Anc's implanted oxygen ions that form the precipitates **18** must be redistributed to form a continuous buried layer **22** of silicon dioxide before forming a gate structure thereover, Anc does not teach or suggest forming a gate structure over the substrate having the precipitate region therein, the precipitate region being noncontinuous, as is presently claimed. The Examiner's argument that the term "noncontinuous" is a relative term, and that Anc's so called continuous buried layer **22** is in effect a "noncontinuous" buried layer **22** because it is formed using similar processing conditions, is disingenuous. Ever since the filing of the present application, the Applicant has claimed a noncontinuous precipitate region. To the contrary, Anc has referred to its buried layer **22** as a continuous buried layer **22** since its filing. Arguing now that Anc's continuous buried layer **22** is actually a noncontinuous buried layer **22**, or alternatively that the claimed noncontinuous precipitate region is actually a continuous precipitate region, is farcical. In sum, the independent Claim 10 requires forming a gate structure over a noncontinuous precipitate region, and Anc at the very most teaches forming a gate structure over a continuous precipitate region.

Third, even if that weren't enough, the processes for forming the claimed noncontinuous precipitate region and Anc's continuous buried layer **22** are far from "similar" or "essentially the same", as the Examiner argues in the Advisory Action. For instance, Anc teaches many additional steps beyond those required by the present invention, any one of which could require the continuous buried layer **22** of Anc to be formed. Moreover, the high temperature annealing protocol in the inert atmosphere taught by Anc, which requires a temperature in a range between approximately 1300°C to a temperature slightly below the melting temperature of the substrate such that the continuous buried layer **22** can be formed, is significantly higher than the relevant anneal temperatures disclosed in the specification of the present invention. Moreover, other significant differences between the two processes additionally exist. Accordingly, contrary to what the Examiner argues, the processes for forming the claimed noncontinuous precipitate region and Anc's continuous buried layer are different, and thus may be attributed to the present invention having a noncontinuous precipitate region and Anc having a continuous buried layer. Thus, for the foregoing reasons, Anc fails to teach or suggest the claimed element of forming a gate structure over the substrate having the precipitate region therein, the precipitate region being noncontinuous.

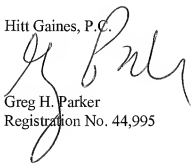
Miz fails to correct the deficiencies of Anc. The Examiner is offering Miz for the sole proposition that oxygen precipitate regions may be used with and applied to SiGe layers formed on silicon substrates. However, a teaching or suggestion that oxygen precipitate regions may be used with and applied to SiGe layers formed on silicon substrates is very different from a teaching of suggestion of forming a gate structure over the substrate having the noncontinuous precipitate region therein, as is presently claimed. Accordingly, Miz also fails to teach or suggest this claimed element.

For all of the foregoing reasons, Anc, individually or in combination with Miz, fails to teach or suggest the invention recited in independent Claim 10 and its dependent claims, when considered as a whole. Accordingly, the references fail to establish a prima facie case of obviousness. Claims 10-13 and 15-22 are therefore not obvious in view of the references.

For the reasons set forth above, the Claims on appeal are patentably nonobvious over Anc and Miz. Accordingly, the Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of all of the Appellant's pending claims.

Respectfully submitted,

Hitt Gaines, P.C.



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VIII. APPENDIX A - CLAIMS

Claims 1-9 (Canceled)

10. (Previously Presented) A method for forming a semiconductor device, comprising:

providing a substrate having a lattice structure;

implanting a precipitate region within said lattice structure;

introducing a dynamic defect within said lattice structure and proximate said implanted precipitate region, such that said implanted precipitate region affects a position of said dynamic defect within said lattice structure; and

forming a gate structure over said substrate having said precipitate region therein, said precipitate region being noncontinuous.

11. (Original) The method as recited in Claim 10 wherein said implanting includes implanting a SiO_2 precipitate region.

12. (Original) The method as recited in Claim 10 wherein said implanting includes implanting a SiN precipitate region.

13. (Original) The method as recited in Claim 10 wherein said precipitate region is located from about 60 nm to about 150 nm below said gate structure.

Claim 14 (Canceled)

15. (Original) The method as recited in Claim 10 wherein said dynamic defect is an edge dislocation, a vacancy, a dislocation loop formed by an agglomeration of vacancies within said lattice, a silicon self-interstitial atom, a substitutional atom, or a dislocation loop formed by the agglomeration of self interstitial atoms.

16. (Original) The method as recited in Claim 10 wherein said substrate is a first silicon substrate and said method further includes forming a silicon-germanium layer over said first silicon substrate and forming a second silicon substrate over said silicon-germanium layer, such that said silicon-germanium layer is in a relaxed state and said second silicon substrate is in a stressed state.

17. (Original) The method as recited in Claim 10 wherein said substrate is a first silicon substrate and said method further includes implanting silicon-germanium region into said first silicon region and forming a second silicon substrate located over said first silicon substrate, such that said second silicon substrate is in a stressed state.

18. (Original) The method as recited in Claim 10 wherein said substrate is a first silicon substrate and said device further includes a silicon or germanium implant induced dynamic defect region within said first silicon region wherein said first silicon substrate is in a stressed state induced by said silicon or germanium implant induced dynamic defect region.

19. (Original) The method as recited in Claim 10 wherein said implanting includes implanting to a peak concentration ranging from about 5E17 atoms/cm^3 to about 5E18 atoms/cm^3.

20. (Original) The method as recited in Claim 10 wherein said implanting includes implanting using an energy ranging from about 40 keV to about 70 keV.

21. (Original) The method as recited in Claim 10 further including annealing said implanted precipitate region using a temperature ranging from about 500°C to about to about 1200°C after said implanting.

22. (Original) The method as recited in Claim 21 wherein said annealing includes a first anneal at a temperature ranging from about 600°C to about 800°C and a second anneal at a temperature ranging from about 1000°C to about 1100°C.

Claims 23-28 (Canceled)

IX. APPENDIX B - EVIDENCE

The evidence in this appendix includes Anc and Miz. Anc and Miz were entered in the record by the Examiner with the Examiner's Office Action dated September 12, 2005.

X. RELATED PROCEEDINGS APPENDIX

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